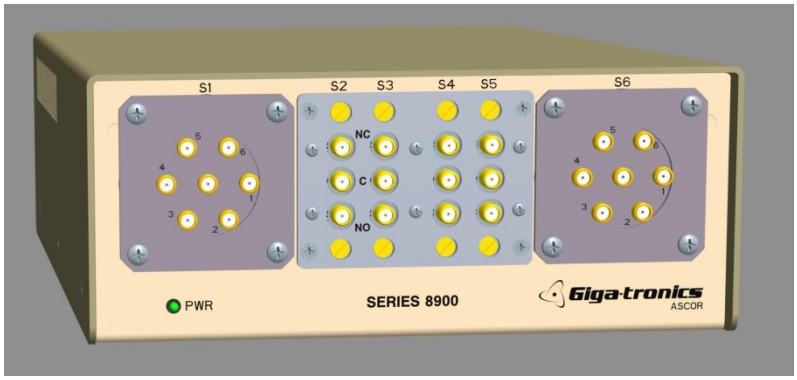
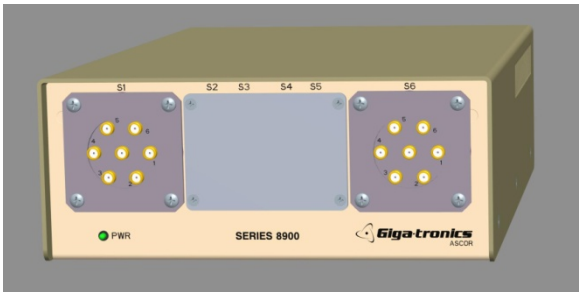
Series 8900 LAN



Part Number **90570300 (example configuration)**



Part Number **90570300-001 (example configuration)**

Operation Manual

All technical data and specifications in this publication are subject to change without prior notice and do not represent a commitment on the part of Giga-tronics, Incorporated.

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Warranty

Giga-tronics Series 8900 instruments are warranted against defective materials and workmanship for one year from date of shipment, or as detailed in the warranty section of this manual. Giga-tronics will, at its option, repair or replace products that are proven defective during the warranty period. This warranty DOES NOT cover damage resulting from improper use, nor workmanship other than Giga-tronics service. There is no implied warranty of fitness for a particular purpose, nor is Giga-tronics liable for any consequential damages. Specification and price change privileges are reserved by Giga-tronics.

MODEL NUMBERS

This manual describes Model Numbers 90570300 and 90570300-001 ONLY, which are part of the Series 8900 LAN includes ONLY. Please contact Giga-tronics concerning other model numbers.

CONTACT INFORMATION

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Regulatory compliance information

This product complies with the essential requirements of the following applicable European Directives, and carries the CE mark accordingly.

89/336/EEC and 73/23/EEC	EMC Directive and Low Voltage Directive
EN61010-1 (1993)	Electrical Safety
EN61326-1 (1997)	EMC – Emissions and Immunity

Manufacturer's Name:
Giga-tronics, Incorporated

Manufacturer's Address
4650 Norris Canyon Road
San Ramon, California 94583
U.S.A.

Type of Equipment:
DC to 26.5 GHz RF Switch

Model Series Number
8900

Declaration of Conformity on file. Contact Giga-tronics at the following;

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Revision History			
Revision	**Description of Change**	**Chg Order #**	**Approved By**
A	Initial Release	03402	RA

Record of Changes to This Manual

Use the table below to maintain a permanent record of changes to this document. Corrected replacement pages are issued as Technical Publication Change Instructions (TPCI). When you are issued a TPCI, do the following:

1. Insert the TPCI at the front of the manual binder.
2. Remove the pages from the manual binder that are noted in the TPCI.
3. Replace the page(s) removed in the previous step with the corrected page(s).
4. Record the changes in the table below.

TPCI Number	TPCI Issue Date	Date Entered	Comments

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SECTION 1

SAFETY AND MANUAL CONVENTIONS

This manual contains conventions regarding safety and equipment usage as described below.

Product Reference

Throughout this manual, the term “Series 8900 LAN” refers to all models of within the series, unless otherwise specified.

Personal Safety Alert

WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Equipment Safety Alert

CAUTION: Indicates a situation which can damage or adversely affect the product or associated equipment.

Notes

Notes are denoted and used as follows:

> ***NOTE:*** Highlights or amplifies an essential operating or maintenance procedure, practice, condition or statement.

Electrical Safety Precautions

Any servicing instructions are for use by service-trained personnel only. To avoid personal injury, do not perform any service unless you are qualified to do so.

For continued protections against fire hazard, replace the AC line fuse only with a fuse of the same current rating and type. Do not use repaired fuses or short circuited fuse holders.

OVERVIEW

This manual describes a version of the Series 8900 LAN products.

Part Number (P/N) 90570300 is a half-rack wide unit with two Single-Pole Six-Throw (SP6T) RF Switches and four Single-Pole Double-Throw (SPDT) switches that are controlled by an Ethernet Interface. Part Number (P/N) 90570300-**001** is the same unit without the four SPDT switches (S2-S5) and cabling. Other configurations are available. The functionality and programming are the same.

The Series 8900 line of switch products are based on rugged electromechanical switches and microwave relays rated for use from DC and up to 40 GHz, with low insertion loss and high isolation. Route signals under remote control to simplify and improve automated test systems. Easily removable switches allow reduced mean time to repair.

The standard Series 8900 offers GPIB, USB, and Ethernet LAN communication interfaces. A self-contained design, with built-in power supplies, microprocessor-based controller board and up to 256 relay coils, makes it easy to implement a microwave switch system. It is designed to host many combinations of microwave relay switches, terminated or non-terminated: SPDT, SP4T, SP6T, SP8T, or Transfer switches. With a standard SCPI command set, the control interface provides the Series 8900 with ease of operation and configurability.

FUNCTIONAL DESCRIPTION

The design is housed in a 2U (3.5 inch) high, half-rack size unit. The unit can be placed on a work bench or fit in a standard 19 inch rack cabinet.

The unit is self contained, that is, it contains its own power supplies, Ethernet interface, RF relay driver circuits and the RF relays mounted on the front. The RF Switches can be removed from the front of the unit.

The Ethernet interface is a VXI-11.3 compliant interface. This interface is an IEEE-488.2 device and uses standard Control commands to control its digital interface. (See Section 2 for the Control Command Set for this instrument.)

A single power supply supplies +12.0 VDC to the unit. The power supply input is 85-264 VAC. (See Section 3 for full specifications)

The RF Switches provided are 50 Ohm impedance, with a frequency range of DC to 26.5 GHz at -3 dB with SMA connectors. (See Section 4 for full specifications)

WARRANTY

Product is warranted to conform to all applicable specifications for a period of one (1) year from the date the unit is shipped, or 10 million cycles in the case of relays, whichever comes first.

FRONT/REAR VIEW

The figures below illustrate the front and rear panels, including power indicator, switch positions, LAN connector location, and labels for the unit.

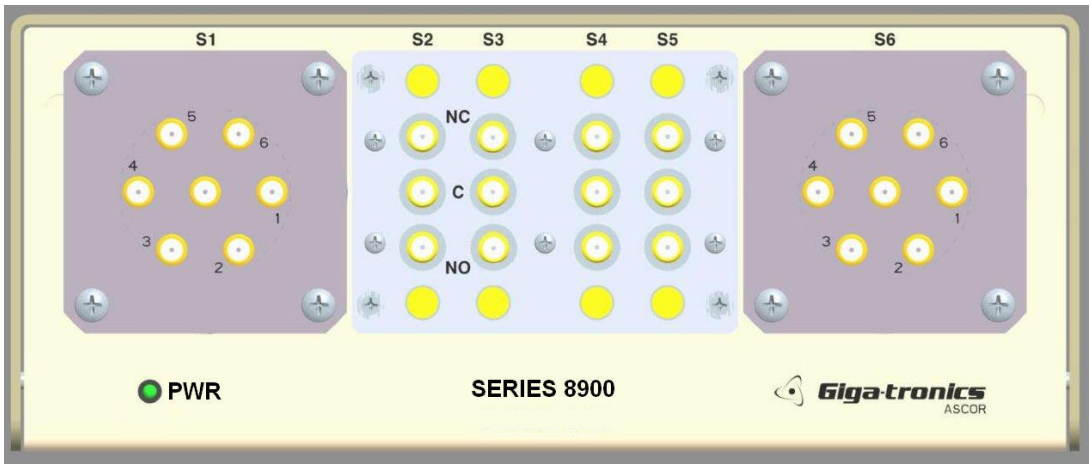

Figure 1: 90570300 Front Panel View (example configuration)

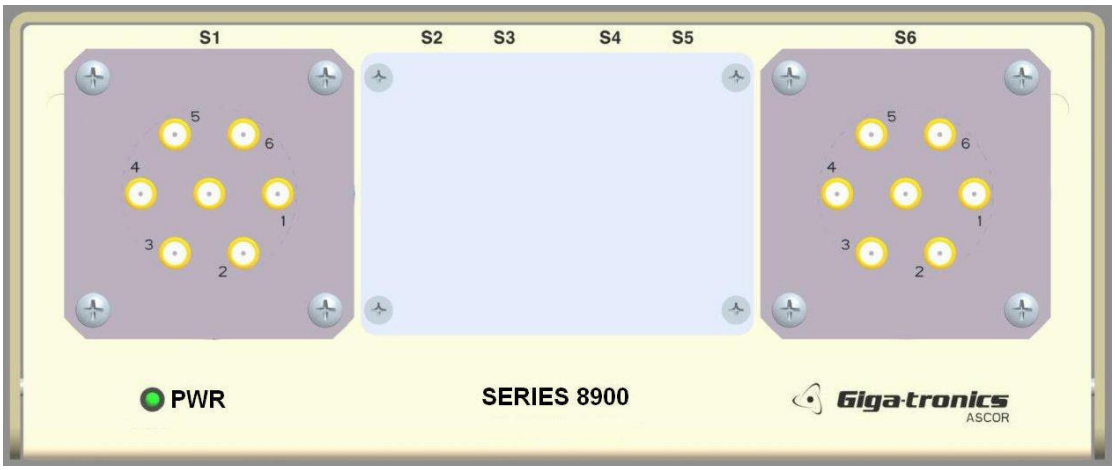

Figure 2: 90570300-001 Front Panel View (example configuration)

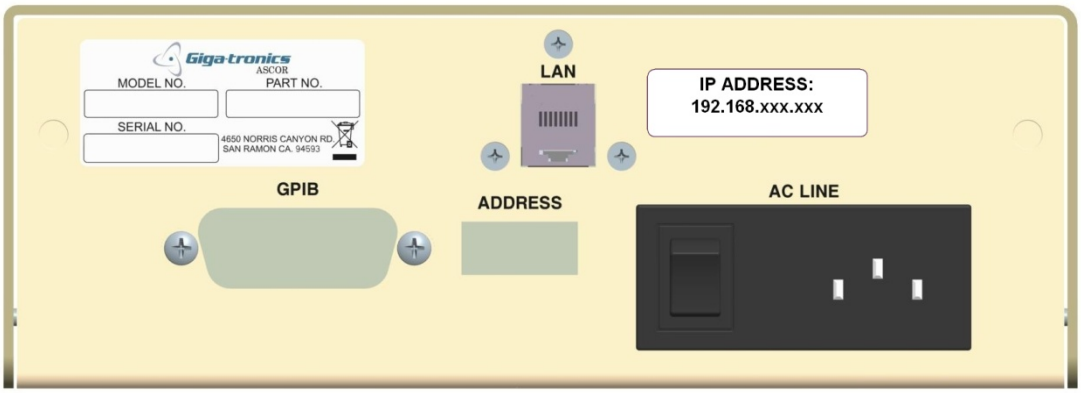

Figure 3: 90570300 Rear Panel View

SECTION 2

UNIT DEFAULTS

This unit is shipped from the factory with the following default settings:
Default IP Address: 192.168.5.254
Default Timeout: 1000 seconds

CONTROL COMMANDS

LOCATION	SW	POSITIONS	CONNECTS TO (on Relay Control board)	SCPI COMMANDS[1]
S1	1	Open	J3	ROUTe:SWITch 1, 0
		1		ROUTe:SWITch 1, 1
		2		ROUTe:SWITch 1, 2
		3		ROUTe:SWITch 1, 3
		4		ROUTe:SWITch 1, 4
		5		ROUTe:SWITch 1, 5
		6		ROUTe:SWITch 1, 6
S2 [1]	2	Open	J10 [1]	ROUTe:SWITch 2, 0
		1		ROUTe:SWITch 2, 1
S3	3	Open		ROUTe:SWITch 3, 0
		1		ROUTe:SWITch 3, 1
S4	4	Open		ROUTe:SWITch 4, 0
		1		ROUTe:SWITch 4, 1
S5	5	Open		ROUTe:SWITch 5, 0
		1		ROUTe:SWITch 5, 1
S6	6	Open	J8	ROUTe:SWITch 6, 0
		1		ROUTe:SWITch 6, 1
		2		ROUTe:SWITch 6, 2
		3		ROUTe:SWITch 6, 3
		4		ROUTe:SWITch 6, 4
		5		ROUTe:SWITch 6, 5
		6		ROUTe:SWITch 6, 6

NOTE: The commands referred to in this manual assume that the switches are connected properly to the relay control board connectors. If the switches are *physically* moved to a different location in the front panel, the command parameters DO NOT change. If such a physical change is made, the user assumes the responsibility of properly identifying the switch locations.

[1] Switches **2-5** are **not installed** in the 90570300-**001** model.

CAUTION **Please consult Giga-tronics factory before making any changes in your equipment!**

[1] The lost digit refers to the position number. The range is "0" to "8".

SWITCH CLOSURE, COUNTER, QUERY COMMANDS

The SCPI commands required to set switch positions, query the switch count, and to save counters are listed below:

These end user commands are always accessible.

ROUTe:SWITch Sw, P — Sets a switch to a desired position. Sw is the switch identification number, 1-nn. P is the desired position as a decimal value.
NOTE: The values shown below are valid only for this product.

Sw [1]	Positions
1	0, 1, 2, 3, 4, 5, 6, 7, 8 (depending on # positions)
2	0=Normally Closed, 1=Normally Open
3	0=Normally Closed, 1=Normally Open
4	0=Normally Closed, 1=Normally Open
5	0=Normally Closed, 1=Normally Open
6	0, 1, 2, 3, 4, 5, 6, 7, 8 (depending on # positions)

ROUTe:SWITch? Sw — Returns switch position, current switch count, and switch identifier string. Sw is a number from 1-nn to identify the switch. The response is: Sw, position, count, ID. An example is:

ROUTe:SWITch? 21
'1, 5, 1002123, 52200310, 2006001, T'

ROUTe:SWITch:SAVe — Saves all switch counter values to flash memory. The command only saves the current counter values.

ROUTe:SWITch:SAVe? — Queries the number of flash saves done via the ROUTe:SWITch:SAVe command, and auto save intervals.

NOTES: The parameter values shown here are valid only for particular model number(s).
[1] Switches **2-5** are **not installed** in the 90570300-**001** model.

TABLE SETUP COMMANDS

The unit firmware includes a Switch Table that the user may enter values into to define the switches in the chassis. The user must take care to not overlap switch definitions. The user must save the table setup with the *SAV 0 command before issuing a ROUTe:SWITch:SAVe command, doing background interval saves or power turn-off saves, otherwise the table setup will be lost.

NOTE:-The Switch table must be setup before connecting the board to the actual switches as the output byte levels will not be correct until the user establishes the table, sets the output port polarity, outputs the logic 0 values and saves the setup.

Table Setup Command	Description
TABLe:OUT Sw, Bits, Poles, Channel#	Defines chassis switches in the Switch Table. Sw is a number from 1-50 to identify the switch. Bits is a number from 1-8 to specify the number of output bits (lines) used by the switch. Set bits to 1 for SPDT, 3 for SP6T, and 0 for none. Poles is a number from 1-255 and sets the maximum position number that the switch can be set to. Set to 2 for SPDT, 6 for SP6T, and 0 for none. Channel# is board's output line number that will control the switch's LSB control line. The firmware assigns additional board channels in ascending bit order. See Table 1 on page 7 for Channel Pin description. An example command is: TABL:OUT 1,3,6,1. This would setup switch 1 for SP6T to be plugged into J3. The firmware will allocate 3 bits (channels 1, 2, 3) to the switch.
TABLe:OUT:ID Sw, string	Writes the User's Switch ID string to the Switch Table. Sw is a number from 1-50 to identify the switch. String is the user's switch identification string. Maximum string length is 23 characters + linefeed. Commas are allowed in the string as separators but cannot be used to start the string. Semicolons are not allowed in the ID string. The ID string has the following format: <Part Number>, <Serial Number>, <Type>. Type is either T for terminated switch and S for non-terminated switch. Example: TABLe:OUT:ID 1, 52200310, 2006001, T
TABLe:OUT:COUNTer Sw, count	Presets the Switch Counter value. Use this command when installing a used Switch in a chassis. Sw is a number from 1-50 to identify the switch. Count is the switch count value for presetting the switch counter to a value. Count values from 0 to 100,000,000. Example: TABLe:OUT:COUNTer 1, 0
TABLe:OUT:LIFe Sw, count	Sets the Switch Life (wear-out) count. Sw is a number from 1-50 to identify the switch. Count is the switch wear-out value. Any count exceeding this value will cause bit 3 in the ESR register to be set. Count values from 1 to 100,000,000. A value of 0 disables the comparison. Example: TABLe:OUT:LIFe 1, 10000000
TABLe:OUT? Sw	Reads the Switch Table entry for a Switch. Sw is a number from 1-50 to identify the switch. The response is: Sw, Bits, Poles, Channel, Count, Life, ID. Example: TABLe:OUT? 1 Response: 1, 3, 6, 1, 0, 10000000, 52200310, 2006001, T
TABLe:OUT:RESet [1]	Clears the Switch Table. Do not execute this command with live switches. The associated output bytes will reset so any connected switches may be put into invalid states. Example: TABLe:OUT:RESet

Table Setup Command	Description
*SAV 0	Saves changes into flash memory. Issue this command after all the modification to the switch table is completed. Example: *SAV 0

Notes:
1 – If the TABLe:OUT:RESet command is issued, then the table MUST be repopulated by issuing the TABLe:OUT with the correct default values (shown below) and the TABLe:LIFe command to set the maximum life count to 10 million (10000000). Issue the TABLe:OUT:COUNTer command to set the switch counter to a non-zero starting count and TABLe:ID command to identify the switch.

Table 1: 90550300 Default Switch Table

Switch	Bits	Poles	Starting Channel
1	3	6	1
2	1	2	29
3	1	2	30
4	1	2	31
5	1	2	32
6	3	6	21

NOTE: Using values other than the defaults listed above can produce unexpected results. Only experienced programmers should alter these values.

SECTION 3

The unit is equipped with a replaceable fuse on the AC power input module

AC INPUT MODULE FUSE

52000100-016 - FUSE, 250V, TYPE T, SLO-BLO, 1 AMP

POWER SUPPLY SPECIFICATIONS

47500700 –Power Supply, UNIV IN, 50W, 12V

INPUT					
Parameter	**Conditions /Description**	**Min**	**Nom**	**Max**	**Units**
Input Voltage	88 – 264 Volts Continuous	88		264	VAC
Source Current	At 115 V ac At 230 V ac		1.3 0.65		A
Inrush Current	At 230 V ac, cold start		40		A
OUTPUT					
Parameter	**Conditions /Description**	**Min**	**Nom**	**Max**	**Units**
Voltage Tolerance	12 VDC	-1		+1	%
Efficiency	Typical		88		%
Setup Rise Time	Setup / rise @ 230 V AC Setup /rise @ 115 V AC		800/50 1000/115		ms
Hold Time	At 230 V ac At 115 V ac		>32 >10		ms
PROTECTION CIRCUIT					
Parameter	**Conditions /Description**				
Short circuit protection	Continuous.				
Load regulation	Min. -0.5 %, Max. +0.5 %				
Over voltage protection	Latch-off mode, 115% to 150%.				
Over current protection	Hiccup mode, auto recovery, 110%				
Ambient Operating Temperature Range	-25° C to 70° C				

SECTION 4

RF SWITCH SPECIFICATIONS

52200310 - SP6T RF SWITCH

RF CHARACTERISTICS						
Number of Ways		6				
Frequency Range		DC-26.5 GHz				
Impedance		50 Ohms				
Frequency (GHz)		DC – 3	3 – 8	8 – 12.4	12.4 – 18	18 – 26.5
V.S.W.R.	≤	1.20:1	1.30:1	1.40:1	1.50:1	1.70:1
Insertion Loss	≤	0.20 dB	0.30 dB	0.40 dB	0.50 dB	0.70 dB
Isolation	≥	80 dB	70 dB	60 dB	60 dB	50 dB
Average Power (25°C)		240 W	150 W	120 W	100 W	40 W
Termination Impedance		50 Ohms				
Termination Avg. Power at 25°C		1 W per termination, 3 W total power				
ELECTRICAL CHARACTERISTICS						
Actuator		Latching				
Nominal Current at 25°C (±10 %)		320 mA / Reset : 1920 mA (See Note 1)				
		Note 1 - Reset : Supply voltage time 1 sec. max./duty cycle 10 %				
Switching Voltage (Vcc)		12 VDC (10.2 to 13 VDC) / Positive Common				
Terminals		25 Pins D-SUB male connector				
MECHANICAL CHARACTERISTICS						
Connectors		SMA Female per Mil-C-39012				
Life		10,000,000 cycles per position				
Switching Time (Nominal Voltage; 25°C)		< 10 ms				
Weight		< 250 g				

NOTE: The diagram below is for illustration purposes only. It is NOT intended to show pin orientation. See Figure 10 on page 15 for connector details.

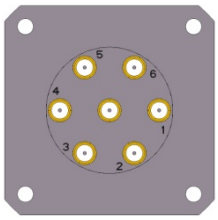

Figure 4: 52200310 Switch Faceplate

52200340-004 - ASSY,4,T-SPDT,26.5 GHz,10M OP, RF Switch

RF CHARACTERISTICS						
Frequency Range		DC-26.5 GHz				
Impedance		50 Ohms				
Frequency (GHz)		DC – 3	3 – 8	8 – 12.4	12.4 – 18	18 – 26.5
V.S.W.R.	≤	1.20:1	1.30:1	1.40:1	1.50:1	1.70:1
Insertion Loss	≤	0.20 dB	0.30 dB	0.40 dB	0.50 dB	0.70 dB
Isolation	≥	80 dB	70 dB	60 dB	60 dB	55 dB
Average Power (25°C)		240 W	150 W	120 W	100 W	40 W
Termination Impedance		50 Ohms				
ELECTRICAL CHARACTERISTICS						
Actuator		Failsafe				
Nominal Current at 25°C (±10 %)		500 mA				
Actuator Voltage (Vcc)		12 VDC (10 to 13 VDC)				
Terminals		Solder Pins				
MECHANICAL CHARACTERISTICS						
Connectors		SMA Female per Mil-C-39012				
Life		10,000,000 cycles per position				
Switching Time (Nominal Voltage; 25°C)		< 10 ms				
Weight		< 500 g (entire assembly)				

NOTE: The diagram below is for illustration purposes only. It is NOT intended to show pin orientation.

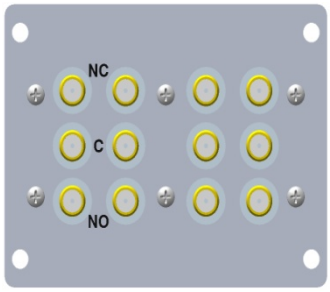

Figure 5: 52200340-004 Switch Faceplate

NOTE: These SPDT Switches are **not installed** in the 90570300-**001** model.

SECTION 5

PARTS LIST/OUTLINE DRAWINGS

90570300 PARTS LIST

90570300 Top Level Assembly

- 85007420 Rev D, PCA, Relay Driver, 40 I_O
- 47000600 PWA, Digital Interface LAN to Parallel PCA
- 47500700 PS, UNIV IN, 50W, 12V/4.2A
- 52000100-016 Fuse, 250V, Type T, SLO-BLO, 1 Amp
- 52200310 RF Switch, 1x6, 26.5 GHz (x2)
- 88102440 Cable Assembly, 1x6 RF Switch (x2)
- 52200340-004 RF Switch Assembly, 4, T-SPDT, 26.5 GHz. [1]
- 88102450 Cable Assembly, for 52200340-004 SPDT Switch Assembly. [1]

NOTE: Only the major components of the system are shown above.

[1] These components are **not installed** in the 90570300**-001** model.

90570300 OUTLINE DRAWING

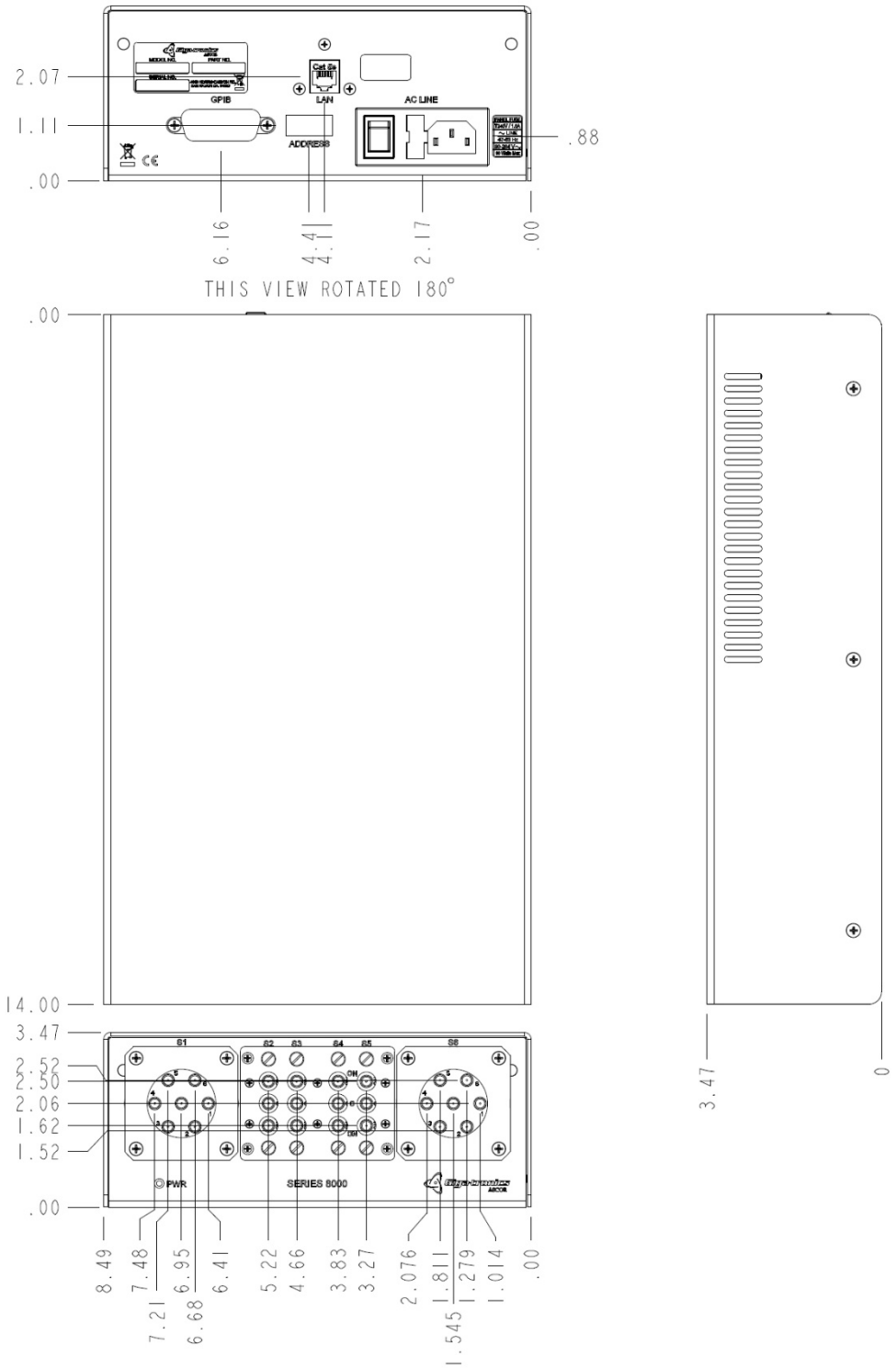

Figure 6: 90570300 Outline Drawing

NOTE: See Figure 10 on page 15 and Figure 12 on page 16 for switch connector numbering details.

90570300 SWITCH CONNECTIONS

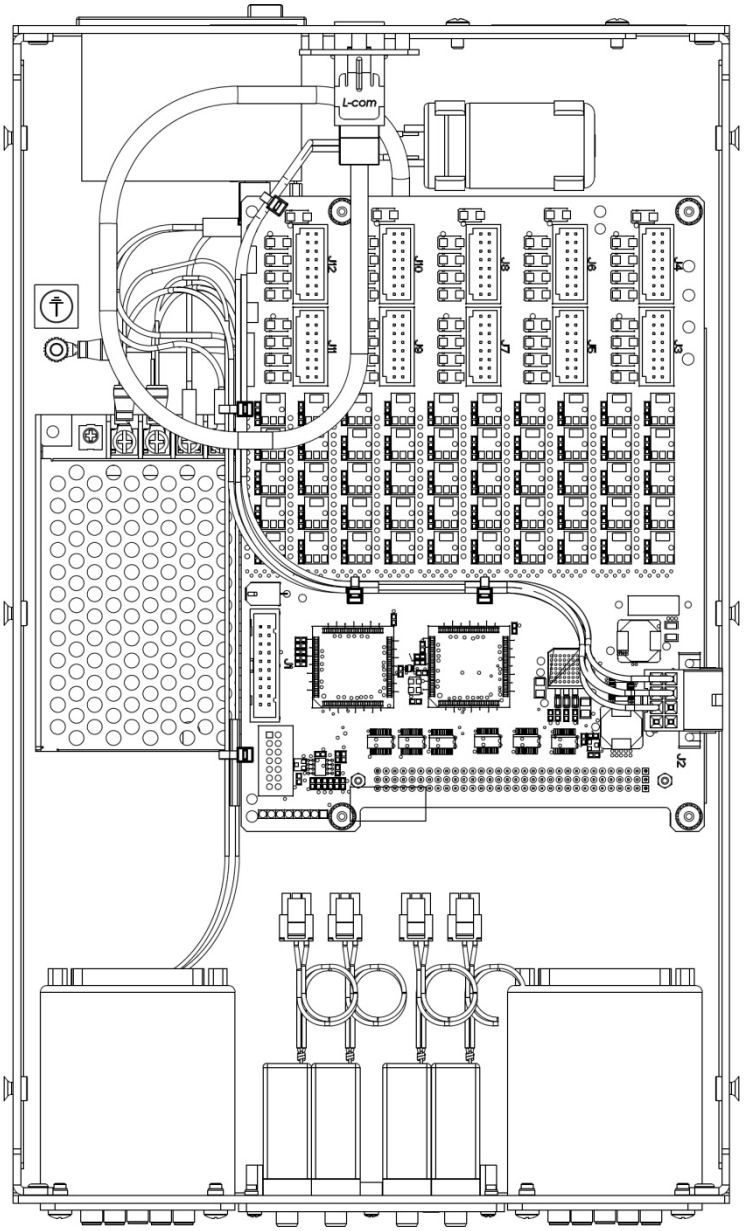

Figure 7: 90570300 Switch Connections Diagram

Table 2: Switch Connections

From	Part #	Connector	To
SW 1	88102440	P2	J3
SW 2 [1]	88102450 [1]	P2	J10
SW 3 [1]			
SW 4 [1]			
SW 5 [1]			
SW 6	88102440	P2	J8

[1] These components are **not installed** in the 90570300-**001** model.

85007420, PCA, RELAY DRIVER BOARD

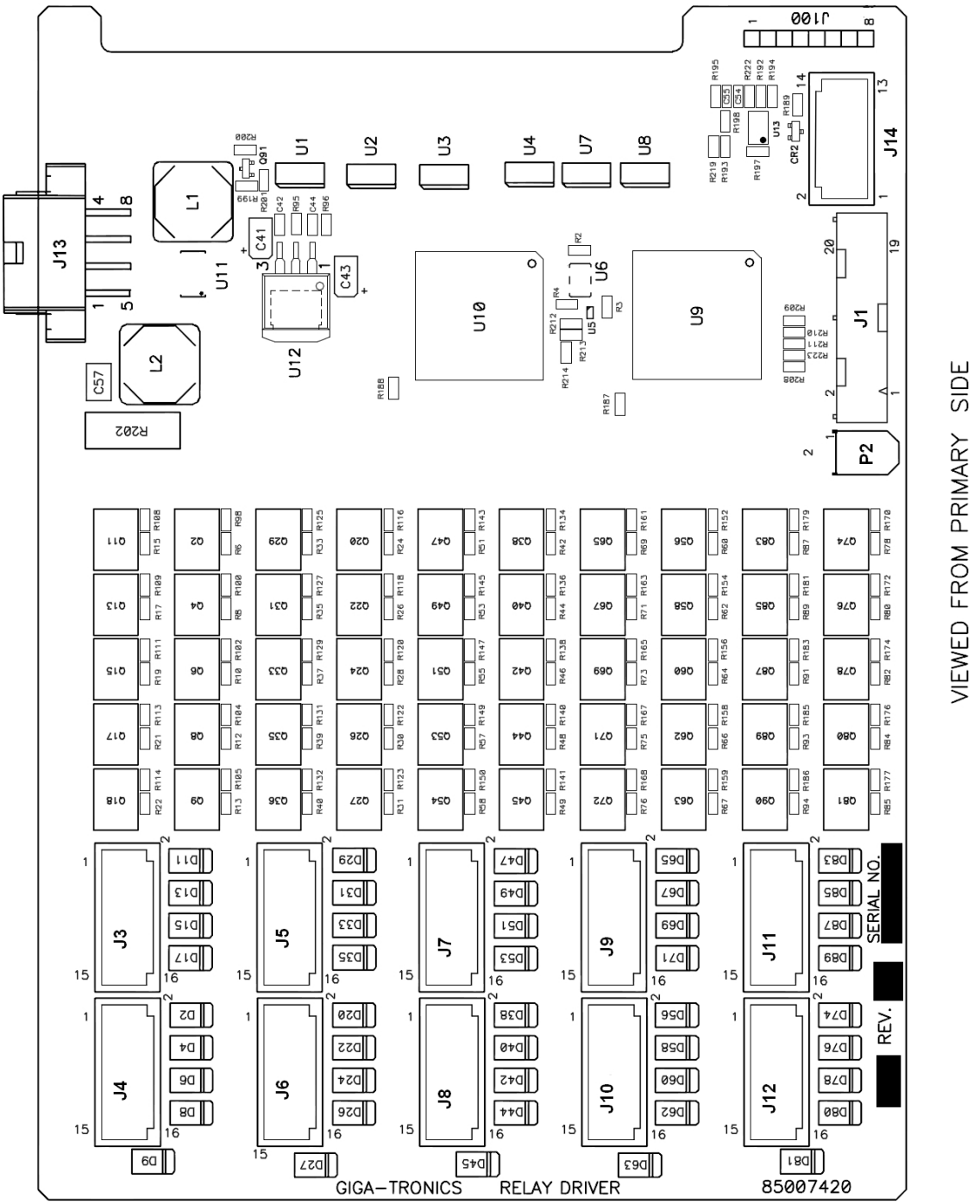

Figure 8: 85007420 Relay Driver Board J-Connector Location Detail

88102440 CABLE ASSEMBLY FOR 1X6 RF SWITCH

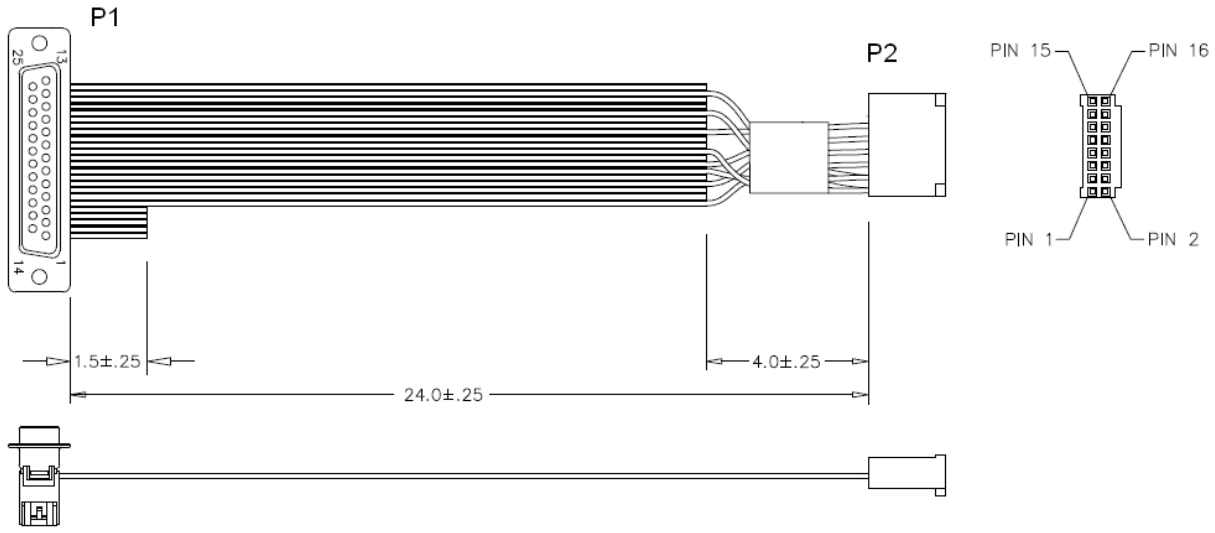

Figure 9: 88102440 Cable Detail

52200310 1X6 RF SWITCH FACE DETAIL

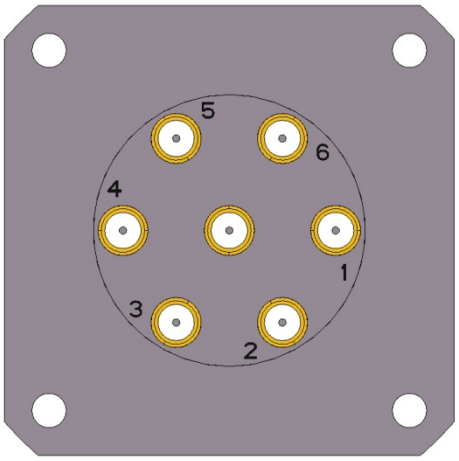

Figure 10: 52200310 Switch Face with Connector Number Detail

All coax connector shall be tightened to the torque specified below.

Connector Type	Material	Torque Value	
		American	Metric
SMA	Stainless Steel	7 – 10 in-lbs.	0.79 – 1.13 N-m

88102450 CABLE ASSEMBLY FOR 4 1X2 RF SWITCH

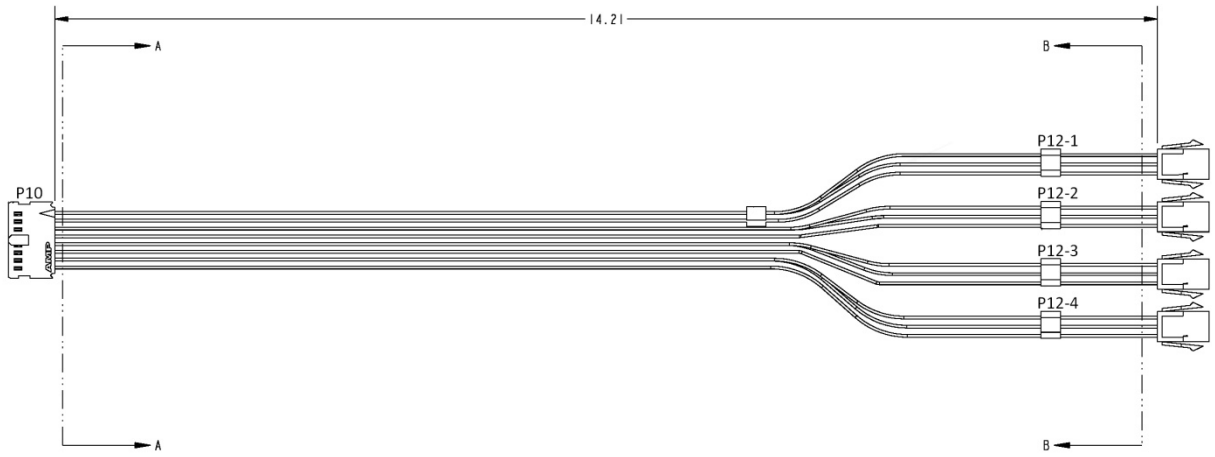

Figure 11: 88102450 Cable Assembly Details

NOTE: This cable is not included with the 90570300-001 model.

52200340-004 SWITCH ASSEMBLY FACE DETAIL

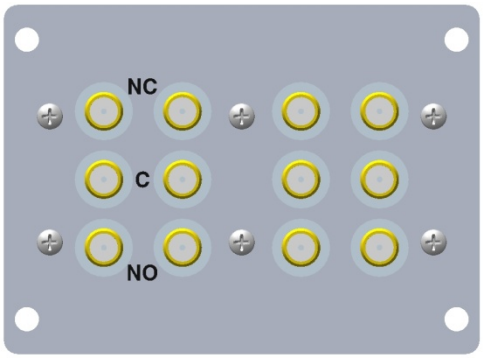

Figure 12: 52200340-004 SPDT Switch Face with Connector Detail

NOTE: This assembly is not included with the 90570300-001 model.

All coax connector shall be tightened to the torque specified below.

Connector Type	Material	Torque Value	
		American	Metric
SMA	Stainless Steel	7 – 10 in-lbs.	0.79 – 1.13 N-m